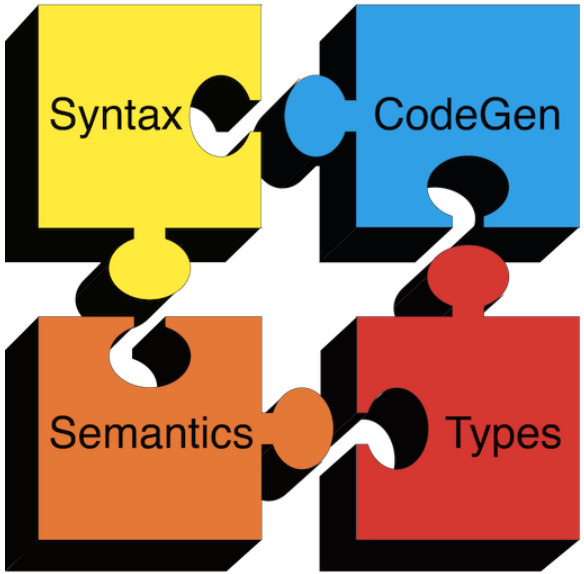
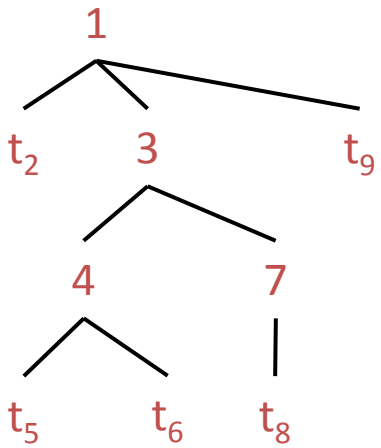


Compilers

Recursive Descent Parsing

Recursive Descent

- The parse tree is constructed
  - From the top
  - From left to right



- Terminals are seen in order of appearance in the token stream:

  t_2 t_5 t_6 t_8 t_9

Recursive Descent

- Consider the grammar

  $E \rightarrow T \mid T + E$

  $T \rightarrow \text{int} \mid \text{int} * T \mid (E)$

- Token stream is: (int_5)

- Start with top-level non-terminal E
  - Try the rules for E in order

Recursive Descent

$E \rightarrow T \mid T + E$

$T \rightarrow \text{int} \mid \text{int} * T \mid (E)$

E

(int_5)

Recursive Descent

$E \rightarrow T \mid T + E$

$T \rightarrow \text{int} \mid \text{int} * T \mid (E)$

E
|
T

(int_5)

Recursive Descent

$E \rightarrow T \mid T + E$

$T \rightarrow \text{int} \mid \text{int} * T \mid (E)$

Mismatch: int does not match (
Backtrack …

(int_5)

Recursive Descent

$E \rightarrow T \mid T + E$

$T \rightarrow \text{int} \mid \text{int} * T \mid (E)$

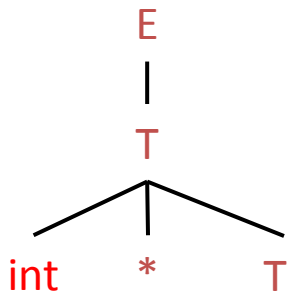
E
|
T

(int_5)

Recursive Descent

$E \rightarrow T \mid T + E$

$T \rightarrow \text{int} \mid \text{int} * T \mid (E)$



Mismatch: int does not match (
Backtrack …

(int_5)

Recursive Descent

$E \rightarrow T \mid T + E$

$T \rightarrow \text{int} \mid \text{int} * T \mid (E)$

E

|

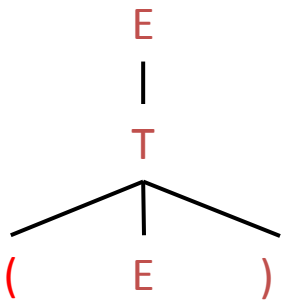
T

(int_5)

Recursive Descent

$E \rightarrow T \mid T + E$

$T \rightarrow \text{int} \mid \text{int} * T \mid (E)$



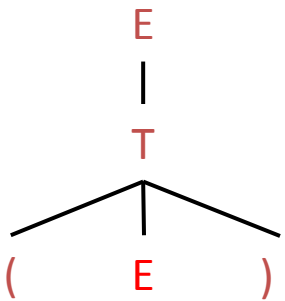
Match! Advance input.

(int_5)

Recursive Descent

$E \rightarrow T \mid T + E$

$T \rightarrow \text{int} \mid \text{int} * T \mid (E)$

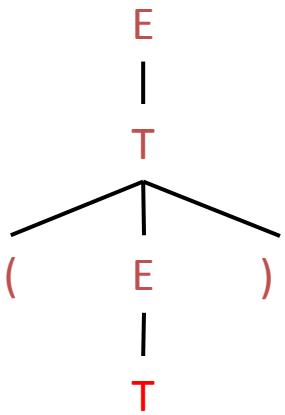


(int_5)

Recursive Descent

$E \rightarrow T \mid T + E$

$T \rightarrow \text{int} \mid \text{int} * T \mid (E)$

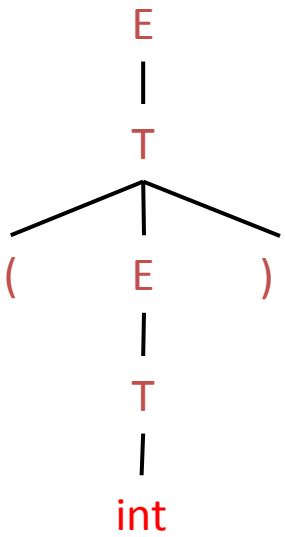


(int_5)

Recursive Descent

$E \rightarrow T \mid T + E$

$T \rightarrow \text{int} \mid \text{int} * T \mid (E)$



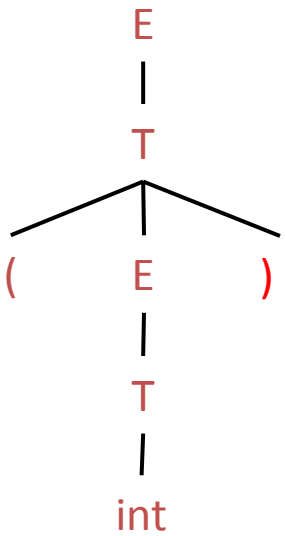
Match! Advance input.

(int_5)

Recursive Descent

$E \rightarrow T \mid T + E$

$T \rightarrow \text{int} \mid \text{int} * T \mid (E)$



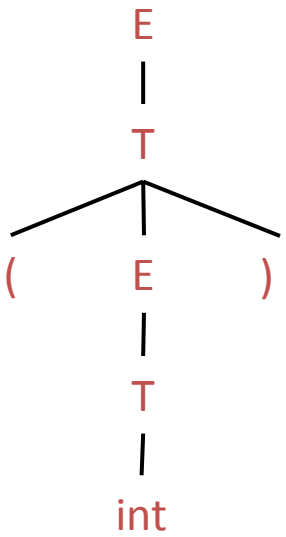
Match! Advance input.

(int_5)

Recursive Descent

$E \rightarrow T \mid T + E$

$T \rightarrow \text{int} \mid \text{int} * T \mid (E)$



End of input, accept.

(int_5)

Recursive Descent

Choose the derivation that is a valid recursive descent parse for the string id + id in the given grammar. Moves that are followed by backtracking are given in red.

$E \rightarrow E' \mid E' + E$

$E' \rightarrow -E' \mid id \mid (E)$

○
E
E’
E’ + E
id + E
id + E’
id + id

○
E
E’
-E’
id
(E)
E’ + E
-E’ + E
id + E
id + E’
id + -E’
id + id

○
E
E’ + E
id + E
id + E’
id + id

○
E
E’
id
E’ + E
id + E
id + E’
id + id